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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/935,510	08/23/2001	Julius L. Goldstein	16918-8183	9482

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EXAMINER	
PENDLETON, BRIAN T	

ART UNIT	PAPER NUMBER
2644	10

DATE MAILED: 10/09/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

H

Office Action Summary	Application No.	Applicant(s)	
	09/935,510	GOLDSTEIN, JULIUS L.	
	Examiner	Art Unit	
	Brian T. Pendleton	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 December 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-65* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *59* is/are allowed.

6)☒ Claim(s) *1-3,6-17,20,21,28-35,38,39,41,43,45-51,55-58 and 60-65* is/are rejected.

7)☒ Claim(s) *4,5,18,19,22-27,36,37,40,42,44 and 52-54* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *8* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 1-3, 20, 21, 33-35, 39, 49, 50, 55-57, 60-64 are rejected under 35 U.S.C. 102(b) as being anticipated by Cummins et al. Cummins et al disclose a hearing aid having a microphone 30 (transducer), a processor containing a digital signal processor 50 which does non-linear amplification and noise and signal tracking (step 67 figure 3). As shown in figure 5, the gain is linear between points K1 and K2 and compressed above the point K2, which is the compression threshold. Discussed in column 3 lines 15-18, the knee point K2 can be varied, making the compression

threshold adaptive. The compression is instantaneous as it does not rely on historical values of the input signals. Claims 1, 2, 20, 21, 33-35, 56, 60, 63, and 64 are met. Also, column 9 lines 29-34 and figure 10 specify that K2 can be varied as a function of the signal and noise estimates. Thus, independent claim 55 and dependent claims 3, 57, 61 and 62 are met. As to claims 7 and 39, there exists a sharp transition between the linear gain section and the compressive gain section. Regarding claims 49 and 50, the processor 50 is a digital signal processor.

Claims 1, 2, 12, 13, 20, 21, 30, 32, 56, 58 are rejected under 35 U.S.C. 102(e) as being anticipated by Armstrong et al. Armstrong et al disclose a multi-channel (per claims 13 and 30) compression amplifier for a hearing aid comprising band split filter 58, compressors 36, 64, and 66, and variable resistors CRH and CRL. The compressors have the transfer function described by figures 3A and 3B, which show a compression region that follows a linear gain region. Claims 1 and 20 are met. The gain is instantaneous (per claims 2 and 21). Regarding claim 12, the manipulation of the variable resistors change the compression threshold values of the respective compressors (see column 3 lines 3-8). Per claim 13, the band split 58 separates the input signal into low frequency signals and high frequency signals. As to claim 32, the transition between the linear range and compressive gain is sharp. As to claims 56 and 58, the variable resistors are used by the user to change the threshold between at least two values.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 6, 31, 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cummins et al in view of Frindle et al. Cummins discloses a hearing aid having a microphone 30 (transducer), a processor containing a digital signal processor 50 which does non-linear amplification and noise and signal tracking, whereby the amplification has a compressed gain region above knee point K2 which is varied according to signal and noise level estimates. Cummins does not teach that the transition between the linear and compressed gain regions is smooth. In figure 3, Frindle et al disclose an compressor amplifier with a soft knee that provides a smooth transition between the linear region A and compressed region B. In column 2 lines 27-37, it was taught that the smooth transition reduces audible distortion, therefore one of ordinary skill in the art would have been motivated to provide that feature in any compressor. Thus, it would have been obvious to one of ordinary skill in the art at the time of invention to use the teachings of Frindle et al and provide a smooth transition knee point in the invention described by Cummins et al.

Claims 8, 9, 11, 28, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cummins et al in view of Armstrong et al. Cummins discloses a hearing aid having a microphone 30 (transducer), a processor containing a digital signal processor 50 which does non-linear amplification and noise and signal tracking,

whereby the amplification has a linear region between points K1 and K2 and a compressed gain region above knee point K2, which is varied according to signal and noise level estimates. Cummins does not explicitly show a decompression threshold higher than the compression threshold whereby the gain is constant and less than the compressive gain. However that feature was standard for hearing aid compression amplifiers, as evidenced by Armstrong et al. In figures 3A and 3B, it is shown that above a decompression threshold 44 (which is higher than compression threshold 38), the gain is constant and less than the compressive gain. According to Armstrong et al, that compression transfer function was conventional in the art. It was beneficial to use such a configuration for the amplifier so that loud sound signals would not be amplified to the point of pain for the hearing aid user. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to incorporate a decompressive gain function in the hearing aid of Cummins et al. As to claim 9, the knee point K2 is adjusted around the predetermined level. Regarding claim 11, Armstrong et al show square root compression in block 84.

Claims 10, 29, 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cummins et al in view of Armstrong et al as applied to claim 8 above, and further in view of Yanick, Jr. The combination of Cummins et al and Armstrong et al disclose a hearing aid apparatus having a non-linear amplifier with a linear gain region, a compression threshold at the end of the linear gain region, a compressive gain region and a decompressive gain region following the compressive gain region starting at a decompression threshold. The combination does not teach an attenuation threshold

above the decompression threshold as required by claim 10. Yanick, Jr. teach a non-linear hearing aid amplifier having an attenuation threshold about 90 db as illustrated in figures 2A-2B and in tables I, II and III. The advantage of the attenuation threshold was that extremely loud sounds which would be damaging to an user's ears are attenuated. Therefore one of ordinary skill in the art would have been motivated to provide such a beneficial feature in the combination of Cummins et al and Armstrong et al which also has a non-linear amplifier.

Claims 13-17, 45, 48, 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cummins et al in view of Armstrong et al. Cummins et al disclose a hearing aid having a microphone 30 (transducer), a processor containing a digital signal processor 50 which does non-linear amplification and noise and signal tracking, whereby the amplification has an instantaneous compressed gain region above knee point K2, which is varied according to signal and noise level estimates. Cummins does not teach a plurality of channels with different audio frequency ranges whereby the compressive threshold K2 is set in each channel independently of the other channels and the threshold is adjusted according to changes in the sound signal. Armstrong et al disclose a multi-channel companding system comprising band split filter 58 and compressors 64,66. In column 1 lines 10-42, it was taught that the threshold of hearing displays a frequency dependence. Thus, one of ordinary skill in the art would have been motivated to provide a compression system which separates the incoming system into different frequency ranges and provide compression in each channel, per the teachings of Armstrong et al. Column 1 lines 32-36 state that a frequency response

shape would appropriately compensate for hearing impairment. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to have a plurality of channels with different frequency ranges and apply the compression techniques in each channel in the Cummins et al invention. The modified Cummins et al invention would adjust the knee point K2 according to signal and noise level estimates in each channel, thereby meeting claims 13-15 and 45. Per claim 16, as stated above a decompression threshold was standard for hearing aid compression amplifiers, as evidenced by Armstrong et al. In figures 3A and 3B, it is shown that above a decompression threshold 44 (which is higher than compression threshold 38), the gain is constant and less than the compressive gain. According to Armstrong et al, that compression transfer function was conventional in the art. It was beneficial to use such a configuration for the amplifier so that loud sound signals would not be amplified to the point of pain for the hearing aid user. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to incorporate a decompressive gain function in the hearing aid of Cummins et al. As to claim 17, the knee points K2 are adjusted around their predetermined levels. Per claims 48 and 51, it was obvious at the time of invention to use either analog or digital signal processing techniques.

Claim 65 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cummins et al. Cummins discloses a hearing aid having a microphone 30 (transducer), a processor containing a digital signal processor 50 which does non-linear amplification and noise and signal tracking, whereby the amplification has a compressed gain region above knee point K2 which is varied according to signal and noise level estimates.

Cummins does not teach that the signal processing is in analog. Examiner takes Official Notice that in the art of signal processing, digital and analog methods were well known and easily implemented. It was an obvious design choice depending on the particular application of the signal processor. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use analog signals in the invention of Cummins et al.

Allowable Subject Matter

Claim 59 is allowed.

Claims 4, 5, 18, 19, 22-27, 36, 37, 40, 42, 44, 52-54 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Andersson et al, US Patent 5,838,807.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian T. Pendleton whose telephone number is (703) 305-9509. The examiner can normally be reached on M-F 7-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester W. Isen can be reached on (703) 305-4386. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9314.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4700.

Brian Tyrone Pendleton
September 25, 2003

MINSUN OH HARVEY
PRIMARY EXAMINER